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Research article

Will Millennials save the world? The effect of age and generational differences on environmental concern

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ABSTRACT

Are younger people, defined by age, or younger generations, defined by cohort-level measures, more concerned about declines in environmental health when compared to their older counterparts within the United States? Related, are these same people more willing to support policy actions aimed at preventing future losses when compared to older adults? In spite of reporting by the U.S. popular press about the heightened environmental consciousness of Millennials, prior research offers conflicting answers. Scholarship focusing on age effects suggests that the answer to both questions is *yes* due to the dampening of environmental concern and action in older adults. More recent applied research on climate related risks and risk management options, by contrast, suggest that the answer to both questions is *no,* and that there is no difference in climate concern and risk mitigation between younger and older adults. In an attempt to disentangle these contradictory viewpoints, we undertook a study in which respondents in the United States characterized by age and generational cohort were presented with small and large hypothetical losses due to climate change. These same participants were then asked to indicate their support for future policy actions aimed at stemming these environmental losses. Overall, our data does not indicate that younger generations experience potential losses as more acute than older generations; neither age nor generational cohort correlated with the perceived severity of environmental losses nor support for future actions to prevent them. More robust predictors of both dependent variables were environmental value orientations (biospherism) and self-reported political orientation.

1. Introduction

As we enter the next federal election cycle in the United States, there is a popular narrative emerging about the importance of motivating and mobilizing younger voters because they are believed to care more about the environment. This response is in part due to actions by the current U.S. President, who during his first three years in office has made significant attempts to roll back existing environmental protections. These decisions by the Trump administration have prompted scientists, citizens, and some politicians to organize in opposition to further executive action that would place the environment at risk. One of the most prominent examples of environmentalism during Trump's first year in the White House was the March for Science, which took place on Earth Day in 2017. Prominent during this, his third year, is the effort to continue to upset the current balance of power in the United States government during the next national election in 2020; key to this effort is the mobilization of younger voters[1]—primarily Millennials—who are believed to be more concerned about, and highly motivated, to protect the environment than their counterparts who were born earlier.

Given the popular narrative that is currently emerging about the importance of motivating and mobilizing younger voters in the United States, it is important to explore if the hope placed in younger people to be more concerned about—and to help protect—environmental health is appropriate. At the same time, we asked if individuals from younger generations could or should really be expected to care more about the

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[1] In 2016, younger voters strongly preferred the more liberal Hillary Clinton over Donald Trump. According to the Pew Research Center, 38% of voters between the ages of 18 and 29 preferred Clinton while only 27% preferred Trump. However, among younger Americans who were eligible to vote, only 46% of them cast a ballot; this represented the lowest—by a wide margin—proportional turnout of voters by age in 2016. See: https://goo.gl/Jfxq41 *and* https://goo.gl/agjCX6.

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declining health of the environment—and be more willing to act to safeguard it—than individuals from older generations.

1.1. Age-based differences

Prior research suggests that older people tend to express lower levels of relative concern for the environment—and a dampened willingness to act to protect it—than do younger people (Casey and Scott, 2006). In an influential review, Van Liere and Dunlap (1980) proposed that lower levels of concern about the environment among older people (relative to younger people) may be due to how individuals of different ages act to maintain or change their relative position within the dominant social order. Akin to the status quo bias (Kahneman et al., 1991) expressing concern about environmental quality, along with actions aimed at protecting it, may be viewed as disruptive to the existing social order. Thus, concern and action may be thought of as posing the greatest relative threat to those who stand to lose the most because their positions within society are most entrenched – namely, representatives of older generations. This, in turn, motivates older people—relative to younger people—to think and act in ways that protect their existing social status and identity.

For every example of greater concern on the part of younger people about the health of the environment—or the willingness to act on them—there is also evidence to the contrary. In the context of climate change, for example, a study of risk perceptions across six different countries (the United States, Canada, China, the United Kingdom, Germany, and Switzerland) found a significant effect of the age of participants in only one of them: Switzerland (Shi et al. 2015, 2016). A multi-country follow-up study on support for measures aimed at mitigating climate change risk through geoengineering found that the age of participants was a non-factor (Visschers et al., 2017).

1.2. Generational cohort-based differences

Beyond the absence of an age effect in the direction of younger people, a recent review by Gifford and Nilsson (2014) suggests that older individuals are the ones who are more concerned about the environment, and who report a greater affinity toward engaging in a broad array of smaller-scale pro-environmental behaviors (e.g., purchasing fair-trade goods and recycling). They hypothesize that this observation may be a function of generational cohort-level (vs. strictly age-related) differences; e.g., certain events such as the importance of being a frugal environmental steward during the Great Depression in the 1930s, and during wartime experiences of the 1940s, may have had a greater effect on the behaviors of people from older generations than they did on people from younger generations, the latter of which were not alive to experience these events. Alternatively, as environmental concern has been positively associated with education and income it may be that older individuals are more likely to have increased dispensable income to engage with pro-environmental behaviors (Van Liere and Dunlap, 1980).

A generation can be defined as a group of individuals who were born within a defined period of time and, importantly, have experienced consequential social and historical events at key developmental stages of their life histories (Smola and Sutton, 2002; Twenge et al., 2010). The lasting effects of these shared events remain relatively constant over an individuals' entire life and creates generational characteristics that those in the cohort share. These characteristics may include a shared world view, values, and attitudes (Kupperschmidt, 2000). Ultimately, this perspective "stays with the individuals throughout their lives and is the anchor against which later experiences are interpreted" (Scott, 2000, pg. 356).

When considering environmental concern from the perspective of generational cohort-level differences, there is evidence of lower levels of concern in older individuals. Among a series of traits and preferences—older generations within the U.S. are thought to be more conservative. This orientation leads to a tendency to focus on business and economic growth (McCright and Dunlap, 2010) when compared to younger generations (Egri and Ralston, 2004). The more conservative value orientations that are ascribed to older generations have not been associated with high levels of environmental concern (e.g., L'Orange Seigo et al., 2014; Shi et al., 2016; Visschers et al., 2017). We're also led to believe that older individuals ascribe to hierarchical value orientations, whereas younger generations tend toward egalitarianism and seek situations that offer collaboration and a sense of purpose.

In support of this idea, younger generations prioritize contemporary policy issues related to sustainability and the environment ahead of issues like civil rights or economic reform, the latter of which tend to be more prevalent among older generations (Benderev, 2014). Furthermore, younger generations—in contrast to their older counterparts—self-report that they would prefer products and policies that lessen humans' impact upon the environment, even if it means that the monetary cost of consumption will increase (Littrell et al., 2005). Indeed, it seems that Millennials are driving businesses and political leaders to make sustainability a primary concern (Smith and Brower, 2012). Overall, there is a belief that younger generations are poised to act to protect the environment (Timm, 2014).

1.3. Research questions

Overall, the effect of age and generational cohort on concern about environmental health is, at best, inconsistent (Wood and Vedlitz, 2007; Malka et al., 2009). There are several generational factors that are thought to influence people's concern about environmental health, and their willingness to support measures aimed at improving it: age, generational cohort, political orientation, and a series of prominent value orientations (e.g., egoism, altruism).

With this as backdrop, our research asked whether younger people (defined by age), or younger generations (defined by cohort-level measures), are more concerned about declines in environmental health, and if they would be more willing to support policy actions aimed at preventing future losses, when compared to older people or older generations? Alternatively, if age or generation do not impact perceived severity of the loss or future action, is there another pattern of decision-making that can be observed? In addition, because cohort-level differences across generations are frequently discussed alongside cultural and political differences, our research sought to clarify the effect of education, income, political and value orientations on these same dependent measures.

2. Methods

2.1. Participants

To answer these research questions, this research focused on age groups that make up the four current generations that are active voting members of the public:

1. The Silent Generation: This generation cohort is comprised of individuals born between 1925 and 1945. Representatives of this generation endured the Great Depression and World War II, and these two distinctive events are believed to have instilled generational characteristics of concern for security, frugality, caution, conformity, and hard work (Egri and Ralston, 2004; Lehto et al., 2006).
2. Baby Boomers: Born between 1946 and 1964, this generation was influenced by the Vietnam war, the civil rights movement, the assassinations of prominent leaders like John F. Kennedy and Martin Luther King, and a period of rapid economic and educational expansion. Members of this generation are often referred to as results-driven, extrinsically motivated, and entitled (Jurkiewicz and Brown, 1998; Kupperschmidt, 2000; Twenge et al., 2010).

3. Generation X: Representatives of this generation were born between 1965 and 1981 and influenced by the AIDS epidemic, the end of the Cold War, a period of relative economic uncertainty, and rising divorce rates leaving many from this generation to be raised in lower-income homes by a single parent. Members of this generation are considered to be highly realistic, resourceful, and self-interested (Murray, 1997; Kupperschmidt, 2000; Smola and Sutton, 2002; Twenge et al., 2010).
4. Millennials: This generation is comprised of individuals who were born between 1982 and 1999. Sometimes referred to as Generation Y, or the Me Generation, individuals from this generation were influenced by the rise of the internet, mass shootings in primary and secondary schools, and prominent business and economic collapses and the associate insecurity that came with them. Members of this generation are typically referred to as being opinionated, distrustful of institutions, technologically savvy, quick to learn, and self-involved (Smola and Sutton, 2002; Elam et al., 2007; Twenge and Campbell, 2008; Twenge et al., 2010).

Participants in this research were United States citizens, and were recruited from an internet panel maintained by Dynata (formerly Survey Sampling International). We applied quasi-random quota sampling (whereby each participant was randomly drawn from a probability sample of active members in Dynata's database) to fulfill age categories that coincided with the four generational cohorts outlined above. In total, 500 participants were recruited to participate in this research ($n = 125$ per generational cohort) as this exceeded the G*Power calculated sample size for adequate statistical power (Faul et al., 2009).

After data cleaning, the total sample was reduced to 469 participants; 31 participants were removed from the data set because they spent less than half the median time (8.9 min) on the instrument, because they failed a series of attention checks, or because they indicated (in response to a screening question) that they did not believe in climate change (because all of the scenarios in this experiment dealt with environmental losses due to climate change).

The overall sample consisted of 60% females ($n = 281$) and 39% males ($n = 181$), which was skewed in the direction of females relative to the national average (51%). Each of the generational categories contained between 22% ($n = 104$) and 26% ($n = 124$) of all respondents. The majority (58%) of respondents went to college ($n = 274$); 19% ($n = 88$) of respondents reported a high school education or lower and 22% ($n = 102$) an education level beyond a bachelor's degree (Table 1).

2.2. Experimental design

Participants in this research were asked to respond to questions in an extensively pretested survey about hypothetical declines in environmental health. These hypothetical declines were described as being brought on by climate change across four distinct, but recognizable contexts: the melting of arctic sea ice, species loss, the loss of protected forests, and drought leading to losses of surface water. The results from these four contexts were later combined during data analysis as there was no difference in perceived severity or future action by context (determined using a two-way mixed ANOVA, $p > .05$). To study how the magnitude of losses might be perceived by different generations, participants responded to losses of both small (6% declines) and large (24% declines) magnitude (Table 2). Based on our pretests, environmental losses of 6% and 24% were selected such that they were deemed both plausible and clearly differentiated as being of small (6%) and large (24%) magnitude.

Table 1
Sample details.

	n	Women	< High school	High school graduate	College or some college	> Bachelor's degree
Millennials	104	61%	0%	18%	58%	26%
Generation X	112	66%	2%	20%	65%	12%
Baby Boomers	122	60%	1%	13%	64%	22%
Silent Generation	124	57%	2%	20%	51%	27%

Participants were randomly assigned to one of the environmental health scenarios and were asked to respond to a small and large loss within the scenario. The presentation order of the small and large losses was counter-balanced to control for order effects. In addition, the written descriptions of the small and large loss scenarios were accompanied by infographics designed to address concerns about numeracy when respondents are asked to consider proportional losses (Table 2).

After reading the scenario, participants answered a series of questions. The first four questions assessed the perceived severity of the loss; responses were reported on bipolar 10-point sliders for questions dealing with the magnitude of the loss (from very small to very large), feelings of worry (from not at all worried to very worried), and two questions about risk (risk to the environment and risk to people, from minimal to high). Responses to these questions were averaged across individuals to create an index of perceived severity (Cronbach's $\alpha = 0.96$ for the 6% loss and $\alpha = 0.92$ for the 24% loss); this scale served as the first of two main dependent variables.

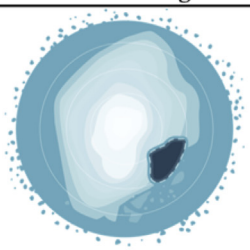
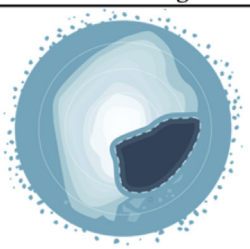
Participants answered three questions about their support for international agreements, regulations aimed at companies and businesses, and personal actions intended to minimize future environmental losses of the type described in the scenario. Responses to these questions were collected on bipolar 10-point sliders that ranged from extremely opposed to extremely supportive; the midpoint was neither supportive or opposed. Responses to these questions were also averaged across individuals to create an index of support for future action aimed at stemming further losses (Cronbach's $\alpha = 0.91$ for the 6% loss and $\alpha = 0.91$ for the 24% loss); this scale served as the second main dependent variable. Once participants finished with their first version of the scenario (small or large loss), they followed an identical procedure for the second level of loss.

We also collected data from each respondent across a series of covariates. These included each respondent's gender, and political orientation (which was measured on a 7-point Likert scale from liberal to conservative; the midpoint was labeled neither liberal nor conservative).

In addition to participants' self-reported political orientation, we also collected data on their value orientations; here we adopted the scales (measured from 0, "opposed to my values", to 7, "extremely important") developed and validated by de Groot and Steg (2008) for measures of egoistic (consideration of individual costs and benefits, 4 items), altruistic (consideration of the costs and benefits to others, 4 items), and biospheric value orientations (consideration of the costs and benefits to the whole ecosystem or biosphere, 4 items). These three scales have been validated by others—to ensure convergent and discriminant validity—using the Oblique Multiple Group Method; this method examines whether items correlate most strongly with dimensions they are intended to measure according to theory while also controlling for self-correlations (see: de Groot and Steg 2007, 2008; Stuive, 2007; Steg et al., 2014; Bouman et al., 2018).

We also included a series of questions aimed at determining the generational cohorts with which each participant identified. The most direct question asked respondents to self-report their age (according to their year of birth). This information was then used to sort participants into generational cohort: the Silent Generation (born between 1925 and 1945), Baby Boomers (born between 1946 and 1964), Generation X (born between 1965 and 1981), or Millennials (born between 1982 and 1999).

Table 2
Environmental loss scenarios.

Context and Description	6% loss image	24% loss image
The cap of frozen seawater around the North Pole plays an important role in maintaining Earth's temperature. Its bright white surface reflects heat from the sun that the much darker ocean would otherwise absorb. Imagine if you learned that because of sudden changes to the Earth's climate, **[6% *or* 24%]** of the Arctic sea ice would be permanently lost over the next three years.		
Large animals such as whales, bears, and elephants play a vital role in ecosystems. Their presence in the food chain helps to maintain a balanced ecosystem. Imagine if you learned that because of sudden changes to the earth's climate, **[6% *or* 24%]** of all the large animal species would be permanently lost over the next three years.		
Yellowstone National Park in Wyoming is made up of a large forest. This forest serves as a wildlife habitat, prevents flooding and soil erosion, absorbs carbon dioxide from the atmosphere, and provides recreational benefits to visitors. Imagine if you learned that because of sudden changes to the Earth's climate, **[6% *or* 24%]** of the forest in Yellowstone National Park would be permanently lost over the next three years.		
Lake Mead in Nevada is the largest reservoir in the United States. This reservoir provides water for people and animals, helps to maintain a balanced ecosystem, and provides recreational benefits. Imagine if you learned that because of sudden changes to earth's climate, **[6% *or* 24%]** of the water stored in Lake Mead would be permanently lost over the next three years.		

2.3. Data analysis

Our first research question asked whether generation predicts perceived severity about losses—of small and large magnitude—in environmental health. To study the differences between small and large losses, we used paired t-tests and linear regression.

Our second research question sought to clarify the effect of demographic characteristics (i.e., gender, year of birth, and political orientation, education, and income), value orientations, and generational characteristics (i.e., literature ascribed generational cohorts) on our dependent variables: perceived severity and future action. These variables were included in a total of four linear regression analyses conducted for each dependent variable across the 6% and 24% loss scenarios. The relationship between the perceived severity and support for future action and the independent variables were compared between small and large loss scenarios using 95% confidence intervals. We used Cohen's guidelines for the interpretation of effect sizes; f^2 of 0.02 is considered a small effect, 0.15 a medium effect, and 0.35 a large effect (Cohen, 1988; Selya et al., 2012). Given our relatively small sample size, we used the software package GPower (Faul et al., 2009) to determine what effect sizes we could expect to find. With a sample size of 469 and 19 predictors in our model, a potential effect size of $f^2 = 0.04$ could be found at 73% power and a f^2 of 0.045 at 80% power.

Our final research question, to determine if there were patterns in participants' perceptions regarding the two main dependent variables beyond generational cohort, we performed a two-step cluster analysis without a predetermined number of clusters with square Euclidean differences and between-group linkages. Two cluster analyses were performed where we used SPSS to group data around perceived severity and future action, one on the small (6%) loss scenarios, and another on the large (24%) loss scenario.

To complement the cluster analyses, which focused on our main independent variables, we conducted a series of statistical tests to determine if there was a significant difference between the two clusters based on the covariates. For continuous variables such as year of birth we ran independent samples t-tests. For ordinal variables, such as participant values, Mann-Whitney U tests were used. To compare multinomial variables, including political orientation, we ran a chi-square test of homogeneity and multiple z-tests of two proportions.

3. Results

3.1. Descriptive statistics and t-tests

3.1.1. Perceived severity

Within the 6% loss scenario, participants demonstrated a mean perceived severity of 6.857 ($SD = 2.284$) on a 10 point scale where a 10 indicated higher perceived severity. By comparison, the mean perceived severity of the 24% loss scenario was 8.149 ($SD = 1.774$). On average, the 24% environmental loss was perceived to be 1.292 more

Table 3
Regression analyses for perceived magnitude of loss and future action in light of the loss in the 6% and 24% loss scenarios.

	Small (6%) Loss				Large (24%) Loss			
	Perceived Severity		Future Action		Perceived Severity		Future Action	
	B (*SE*)	sr^2	*B* (*SE*)	sr^2	*B* (*SE*)	sr^2	*B* (*SE*)	sr^2
Constant	2.024 (0.917)		−1.884 (1.359)		3.363 (0.704)		−2.901 (1.338)	
Age	−0.006 (0.020)	0.000	−0.027 (0.030)	0.001	0.025 (0.016)	0.004	−0.010 (0.030)	0.000
Generation								
Silent Gen.	0.337 (0.983)	0.000	1.001 (1.456)	0.001	−1.160 (0.754)	0.004	0.483 (1.433)	0.000
Baby Boomers	0.782 (0.715)	0.002	0.958 (1.061)	0.001	−0.514 (0.548)	0.001	0.539 (1.045)	0.000
Generation X	0.042 (0.423)	0.000	0.282 (0.625)	0.000	−0.426 (0.325)	0.003	0.283 (0.616)	0.000
Political 2	0.287 (0.388)	0.001	−0.296 (0.576)	0.000	−0.050 (0.298)	0.000	−0.064 (0.567)	0.000
Political 3	0.004 (0.410)	0.000	−0.434 (0.604)	0.001	0.104 (0.313)	0.000	−0.090 (0.595)	0.000
Political 4	−0.466 (0.327)	0.003	−1.799*** (0.483)	0.018	−0.555* (0.250)	0.008	−1.193* (0.475)	0.008
Political 5	−0.810 (0.432)	0.006	−3.243*** (0.641)	0.033	−0.979** (0.330)	0.015	−2.507*** (0.631)	0.021
Political 6	−0.770 (0.402)	0.006	−2.409*** (0.592)	0.021	−0.687* (0.307)	0.008	−1.637*** (0.583)	0.010
Political 7 (conservative)	−0.652 (0.420)	0.004	−3.216*** (0.620)	0.035	−0.741* (0.319)	0.009	−2.519*** (0.610)	0.023
Egoism	0.142 (0.077)	0.006	0.007 (0.114)	0.000	0.066 (0.059)	0.002	0.038 (0.113)	0.000
Altruism	−0.084 (0.127)	0.001	0.160 (0.185)	0.001	0.042 (0.096)	0.000	0.308 (0.182)	0.004
Biospherism	0.832*** (0.118)	0.084	1.606*** (0.170)	0.116	0.648*** (0.089)	0.088	1.524*** (0.167)	0.110
Education	−0.244 (0.417)	0.001	−0.649 (0.617)	0.001	−0.207 (0.320)	0.001	−0.091 (0.608)	0.000
Income	0.017 (0.043)	0.000	0.110 (.064)	0.004	0.045 (0.033)	0.003	0.055 (0.063)	0.001
Gender	0.713** (0.210)	0.020	0.268 (0.311)	0.001	0.226 (0.162)	0.003	0.075 (0.306)	0.000
Age*Education	0.002 (0.007)	0.000	0.013 (0.011)	0.002	0.003 (0.006)	0.000	0.007 (0.010)	0.001
Age*Income	0.002 (0.002)	0.002	−0.003 (0.003)	0.001	0.001 (0.002)	0.000	−0.003 (0.003)	0.001
Age*Gender	−0.032*** (0.011)	0.014	−0.022 (0.016)	0.002	−0.009 (0.009)	0.002	−0.019 (0.016)	0.002
R^2	0.271		0.431		0.292		0.416	
Number of observations	469		469		469		469	
df	19, 449		19, 449		19, 449		19, 449	

*$p < .05$; **$p < .01$; ***$p < .001$.
B is the unstandardized regression coefficient.
VIF was below three for all non-dummy variables.

severe, a significant difference (t (468) = −18.686, $p < .001$).

3.1.2. Future action

On average, participants in the 6% loss scenario ($M = 6.142$, $SD = 3.857$) were less willing to commit to future action than those in the 24% loss scenario ($M = 6.717$, $SD = 3.751$). A significant difference of (t (468) = −6.755, p < .001) 0.58 between the loss scenarios was observed.

3.2. Regression analyses

3.2.1. Perceived severity

For the 6% loss scenario, we found that biospherism, gender, and an interaction between age and gender were significant predictors of the perceived severity of the loss (Table 3). Perceived severity of the 6% loss was greater for males and explained 2% of the variance in perceived severity. For participants with stronger biospherism values, perceived severity was increased with 8.4% of the variance explained. Biospheric value orientation had a stronger effect than gender, but both produced small effect sizes ($f^2 = 0.115$ and $f^2 = 0.027$, respectively). The effect size of biospheric value orientation, while small to medium, exceeds 90% power to detect a true effect. By comparison, the effect of gender on perceived severity has just over 50% power and may indicate that the small sample size has resulted in an overestimation of significance. Previous studies parallel our observed relationship between biospheric value orientation and environmental concern. de Groot and Steg (2008) observed a positive relationship between the New Environmental Paradigm (NEP), their measure for environmental concern, and a biospheric value orientation at a calculated medium to large effect size.[2] In addition, although there is no overall effect of age, there is a significant crossover interaction between age and gender, a small effect. As men age, their perceived severity of the loss decreases at a much quicker rate in comparison to females who have a more gradual reduction in perceived severity as they age. The overall model explained 27.1% of the variance.

For the 24% loss scenario, we again found that high levels of biospherism predicted an increase in perceived severity and explained 8.8% of the variance. In addition, perceived severity was significantly negative for those who identify as more conservative (those who self-reported their political orientation as 4, 5, 6, or 7) in comparison to those who identify as 'Liberal' or a '1' on the political orientation scale. A political orientation of 4, 6, and 7 explained less than 1% of the overall variance and a political orientation of 5 accounted for 1.5%. The overall model accounted for 29.2% of the variance in perceived severity (Table 3). The effect size of biospheric value orientation ($f^2 = 0.124$) and political orientation (4: $f^2 = 0.011$; 5: $f^2 = 0.021$; 6: $f^2 = 0.011$; and 7: $f^2 = 0.013$) was small. The small to medium effect size of the biospheric value orientation exceeds 98% power to detect a true effect and is similar to the relationship observed in the literature (de Groot and Steg, 2008). For self-reported political orientation values of 4 or larger, there was less than 40% power. A small to medium effect size was also estimated[2] for the negative relationship between conservative political ideology and climate change concern observed by McCright (2010).

3.2.2. Future action

For the 6% loss scenario, significant predictors included political orientations that leaned conservative (those who self-reported their political orientation as 4, 5, 6, or 7 where 7 was "conservative"); these respondents were significantly less likely to support future action aimed

[2] Calculated Cohen's *d* using reported standardized regression coefficients, standard deviation of the DV, and sample size. This was then compared to Cohen's (1988) guidelines for interpretation of effect size where $d = 0.20$ is a small effect size, $d = 0.50$ is medium, and $d = 0.80$ is a large effect size.

(*footnote continued*)

at stemming climate losses. A political orientation of 4 accounted for 1.8% of the variance, a 5 accounted for 3.3%, a 6 accounted for 2.1%, and a 7 accounted for 3.5%. Conservative political orientation had a small to medium effect size (4: $f^2 = 0.032$; 5: $f^2 = 0.058$; 6: $f^2 = 0.037$; and 7: $f^2 = 0.062$). When evaluating future action, political orientation ranged from 60% (associated with a 4 out of 7 on the political orientation scale) to over 90% (associated with a 7 out of 7 on the political orientation, where 7 was "conservative") power to detect a true effect. Raimi et al. (2017) also reported small to medium effect sizes for elements of their study that suggest policy preferences that promote actions to mitigate climate change given conservative political ideology. However, a stronger identification with a biospheric value orientation was a significant and positive predictor of support for future action, accounted for 11.6% of the variance and had a medium to large effect size ($f^2 = 0.203$). Given the medium to large effect size associated with biospheric value orientation, we had over 99% power to detect a true effect. de Groot and Steg (2010) also observed a significant positive correlation between biospherism and their measures of pro-environmental intentions with a calculated medium to large effect size.[2]

In the 24% loss scenario, support for future action to stem climate losses was significantly negative for some of the most conservative participants (those who self-reported their political orientation as 4, 5, 6, or 7 where 7 was "conservative"). A 4 on the political orientation scale accounts for 0.8% of the variance, a 5 accounts for 2.1%, a 6 accounts for 1%, and a 7 accounts for 2.3%. Conservative political orientation has a small effect size (4: $f^2 = 0.014$; 5: $f^2 = 0.036$; 6: $f^2 = 0.017$; and 7: $f^2 = 0.039$). The power associated with conservative political orientation ranges from 25% to over 70%. In the 24% loss scenario, the effect size of conservative political orientation was smaller than that observed in the literature (Raimi et al., 2017). Identification with a biospheric value orientation was also a highly significant and a positive predictor of willingness to take action. A biospheric value orientation accounted for 11% of the variance and had a medium to large effect ($f^2 = 0.188$). The effect size of the biospheric value orientation exceeds 99% power to detect a true effect. This mirrors the effect size calculated[2] from de Groot and Steg (2010). Overall, the model fit was accounted for 41.6% of the variance.

3.3. Cluster analyses

3.3.1. Small (6%) losses

To determine if there was an observable profile of participants whose perceptions of perceived severity and future action were similar according to variables other than generational cohort, a two-step cluster analysis for perceived severity and future action in the small (6%) loss scenario was carried out; the analysis did not include a predetermined number of clusters and was instead designed to group the data set around the dependent variables of perceived severity and future action. The analysis resulted in two distinct clusters (Fig. 1A). Fig. 1A illustrates the distinction between clusters 1 (the "cautious") and 2 (the "concerned"). Relative to cluster 2, cluster 1 was characterized by participants whose judgments about perceived severity and future action were lower. By comparison, cluster 2 includes participants who perceived higher levels of loss and increased willingness to take future action.

An independent *t*-test was run to determine if there were differences in age between clusters 1 and 2 of the 6% loss. However, there was no significant difference in age between participants of each cluster, $t_{(454)} = 1.044$, $p = .297$. Mann-Whitney U tests were used to determine if the ordinal variables we used differed according to cluster. There was no significant difference between the cautious and the concerned for the egoism value orientation ($U = 21257$, $z = -1.449$, $p = .147$). However, "the cautious" ($M_{Altruism} = 5.5$; $M_{Biospherism} = 5$) also scored significantly lower on the scales for the altruistic and biospheric value orientations than "the concerned" ($M_{Altruism} = 6.5$; $M_{Biospherism} = 6.5$; $U = 11631$, $z = -8.806$, $p < .001$ *and* $U = 19442$, $z = -3.051$, $p = .002$, respectively).

In terms of self-reported political orientation, a chi-square test of homogeneity determined that there was a statistically significant difference ($p < .001$) between the proportions of political categories across the two clusters. *Post hoc* analyses involved pairwise comparisons using the z-test of two proportions with a Bonferroni correction. The proportion of participants who identified as more liberal (i.e., self-ratings of 1, 2, or 3) on the political orientation scale was significantly higher in the concerned than the cautious ($p < .05$). By comparison, the proportion of participants who identified as more conservative (i.e., self-ratings of 5 and 6 only) was significantly higher in the cautious than the concerned ($p < .05$). There was no significant difference between clusters for those who identified as neither liberal nor conservative (4) or strongly conservative (7). In summary, the cautious had a larger proportion of participants who leaned conservative whereas the concerned had a larger proportion of participants who leaned liberal.

3.3.2. Large (24%) losses

A two-step cluster analysis was also run on the large (24%) loss scenario for perceived severity and future action. This cluster analysis once again determined that there were two distinct groups (Fig. 1B); participants in cluster 1 perceived the severity of the loss to be lower than those in cluster 2. In addition, participants in cluster 1 were less willing to commit to future action to address the loss. Following the cluster analysis, a series of statistical tests were run to determine if clusters 1 and 2 differed by independent variables. Once again, we refer to cluster 1 as cautious and cluster 2 as concerned.

To determine if there were differences in age between the cautious and the concerned of the 24% loss an independent *t*-test was run. There was no significant difference in age between participants of each cluster, $t_{(452)} = -1.312$, $p = .190$. To test if the clusters from the 24% loss scenario differ on ordinal independent variables, Mann-Whitney U tests were performed. There was no significant difference between the cautious and the concerned with regards to the egoism value orientation ($U = 23401.5$, $z = -0.139$, $p = .890$). By comparison, participants in the cautious ($M_{Altruism} = 5.5$; $M_{Biospherism} = 5.25$) also scored significantly lower on the scales for the altruistic and biospheric value orientations than the concerned ($M_{Altruism} = 6.5$; $M_{Biospherism} = 6.5$; $U = 11504.5$, $z = -9.157$, $p < .001$ *and* $U = 10875.5$, $z = -9.652$, $p < .001$, respectively).

For self-reported political orientation, a chi-square test of homogeneity demonstrated a significant difference between clusters ($p < .001$). A post-hoc tests of pairwise comparisons using the z-test of two proportions with a Bonferroni correction mirrored the patterns observed in the 6% loss scenario.

4. Discussion

This research asked whether younger people—defined by age or generational cohort—are more concerned about declining environmental health as a result of climate change, and whether they are more willing to support future actions aimed at stemming future losses, when compared to older people. In this study, we did not find evidence of increased concern or support of future action amongst younger people.

We compared environmental losses of relatively small and large magnitude. In addition to including age and generational cohort as our primary independent variables, we also included a series of covariates; these were a series of dominant value orientations (as stand-ins for "culture", which is notoriously challenging to measure; see van der Linden et al. (2017)) and political orientation. Our research was motivated by the suggestion, popularized by corporations and the media, that the generational cohort to which an individual belongs may influence their response to environmental change. According to recent reports (World Economic Forum, 2017), for example, representatives of younger generations tend to highlight environmental risks related to climate change (and associated habitat loss) as being among the world's

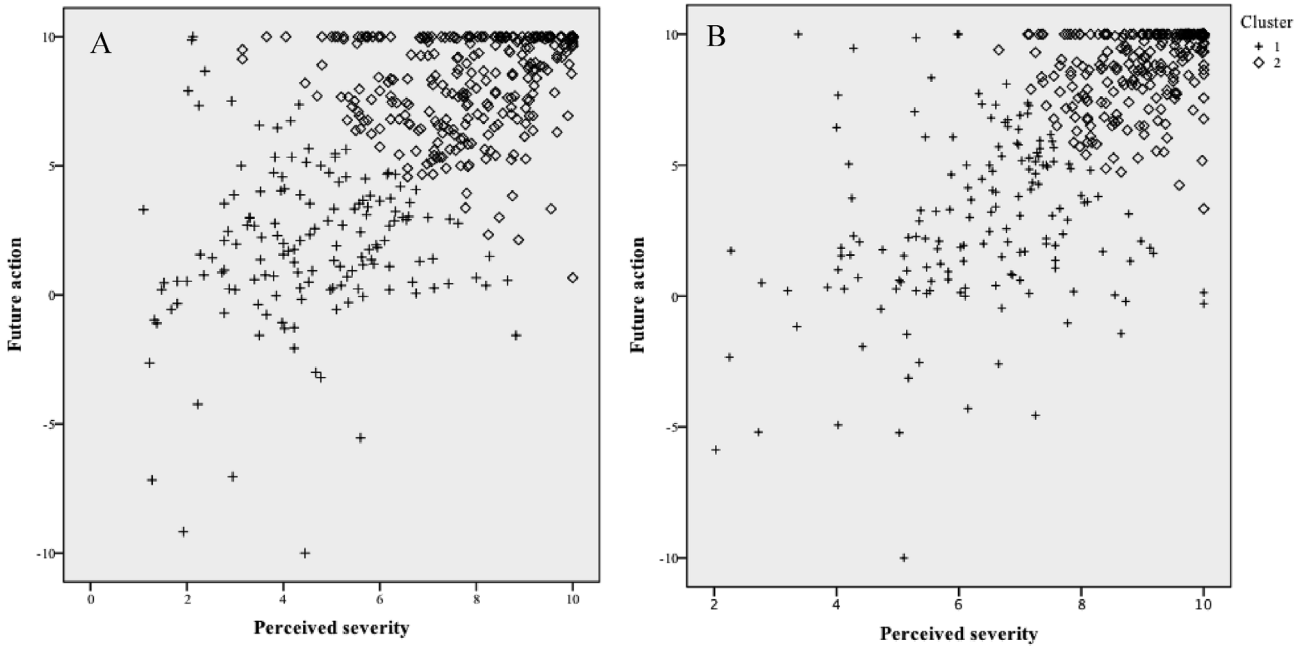


Fig. 1. Two-step cluster analysis grouped around the two dependent variables used in this research (*perceived severity* and *future action*) in the 6% (A) and 24% (B) loss scenarios.

most significant problems; likewise, recent media reporting (e.g., see recent reporting by NBC News[3] and The Huffington Post[4]) has suggested that this heightened level of concern among younger people will lead to changing consumption habits and higher levels of support for actions—policy and otherwise—aimed at stemming these losses.

In contrast to the reports of popular media, there has been a persistent lack of agreement observed between environmental attitudes and pro-environmental behavior. For example, air travel is known to have a significant environmental impact due to the production of greenhouse gas emissions from combustion of aviation fuel (Gössling et al., 2007). However, there is little sign of air travel behavior change even amongst the most environmentally aware and "greenest" travelers (Böhler et al., 2006; Barr et al., 2010). The same pattern holds for many other attitude-behavior combinations.

The disconnect between attitudes and behavior has been attributed to both external and internal factors that can act as barriers (Kollmuss and Agyeman, 2002). External factors can include institutional, economic, or social and cultural factors. Internal factors that can impair behavior change include motivation, knowledge, values, attitudes, emotions, and responsibilities and priorities (Ajzen and Fishbein, 1980; Hines et al., 1987; Kollmuss and Agyeman, 2002; Padel and Foster, 2005). The factors that shape our behavior often conflict and compete, and they demonstrate that—despite increased concern about the environment amongst younger people—it is not safe to assume that concern will translate into action.

Additionally, in the past it has been difficult to determine if age and generational cohorts influence an individual's response to environmental change, as people—regardless of their age or generational cohort—are asked for their opinions about environmental losses, and questions are often posed in a context-free manner. In other words, respondents are often asked to respond to broadly characterized challenges (like climate change or habitat loss), but not to specific magnitudes of these losses. In addition, it has been our observation that measures of generational differences tend to be rather simplistic. For example, though much of the discourse around generational differences centers on cohorts (i.e., Millennials vs. Generation X and Baby Boomers), these differences are based on the age of participants and not on cohort-level measures (Dimock, 2018). Thus, the term "generation" is instead used as a way to conveniently—but, ultimately, imprecisely—categorize individuals of a certain age.

For these reasons, our research sought to describe generational cohort in a manner that went beyond self-reported age and age-based assignment to generational cohorts; we also asked participants for their reactions to specific levels of environmental loss across a series of specific climate change contexts, and to use strength-of-preference measures for policies and actions aimed at ameliorating them.

Returning to our primary research question, we found little evidence that younger people—defined by age or generational cohort—are more concerned about declining environmental health (Table 3). Similarly, we found no evidence for a greater willingness on the part of younger people—and younger generations—to support future actions aimed at stemming future losses when compared to older people and older generations.

Specifically, we could detect no consistent and significant difference between generations and ages in terms of their response to the small (6%) and large (24%) losses associated with climate change. Only responses to the small (6%) loss pointed to an age and gender interaction effect for perceptions of severity. Here, as age increased male participants reflected a much steeper decrease in perceived severity than females. However, this pattern in perceived severity for age and generation in the 6% loss was not consistent with the large magnitude loss (Table 3).

When looking specifically at willingness to support future environmental action, the political orientation of participants was a significant predictor and demonstrated a small to medium effect size with a range of probabilities to detect a true effect. Previous studies have demonstrated that the self-identified conservatives report beliefs that are less consistent with scientific consensus and express less concern (Van Liere and Dunlap, 1980; MCright, 2011; Dunlap et al., 2016). Within this study, participants who do not believe that climate change is occurring were screened out, leaving only those participants who accept the reality of climate change. Even amongst self-identified conservatives who believe that climate change is occurring, willingness to support future environmental action was lower in comparison to liberals. As

[3] https://goo.gl/aEYFD.
[4] https://goo.gl/hPWXd9.

participants' self-reported political orientation increased in the direction of conservativism, their commitment to future action decreased in comparison to liberals (Table 3). It is noteworthy, however, that the differentiation amongst those of different political orientations was less strongly demonstrated in the 24% loss scenario and did not extend to evaluations of the perceived severity of loss in the 6% scenario. This result suggests that the divide in terms of how people with different political orientations respond occurs not in how the loss is perceived (i.e., as small or large in magnitude), but instead when people are asked to act on them. In addition, the small to medium effect sizes and varying power calculations may in part be due to our treatment of the variable as ordinal instead of continuous as is commonly practiced within the literature.

How a participant perceives the severity of losses in the 6% and 24% loss scenarios, as well as the strength of their support for future environmental action, were consistently explained by the how strongly participants identified with biospheric value orientations. Identifying strongly with biospheric values led to a corresponding increase in judgments about the perceived severity of the loss, and a corresponding increase in participants' willingness to commit to future action.

Overall, a biospheric value orientation was a more robust predictor of perceived severity and the willingness to take future action than was age and generation. Those with a biospheric value orientation will consider the costs and benefits of their actions on the whole ecosystem or biosphere instead of the individual costs and benefits—i.e., egoism)—or the costs and benefits to other people—i.e., altruism (Stern and Dietz, 1994; de Groot and Steg, 2008). In our study, pro-environmental beliefs such as perceived magnitude of the loss and commitment to environmental action have been positively correlated with biospheric values. Value orientations have been shown to be a consistent and strong predictor of environmental attitudes, specifically the positive relationship between biospherism and pro-environmental attitudes (Schultz and Zelezny, 1999).

The cluster analysis then determined that there were two distinct ways in which participants responded to the loss scenarios: There were participants who perceived the severity of losses to be low coupled with a low strength-of-preference for taking future action to stem losses; and, there were participants who tended toward the higher ends of the scales for both of these items. Exploring the characteristics of the clusters, altruistic and biospheric value orientations were consistently and significantly different between clusters. Lower scores on the biospherism and altruism scales correlated with "the cautious" cluster that reported low perceived severity and future action. Higher biospheric and altruistic values correlated with "the concerned" cluster that reported higher perceived severity and future action.

Overall, our research suggests that political and value orientations are better predictors of environmental concern and action than generation and age, which had inconsistent or non-existent effects. Based on this finding, we suggest a sharper focus—especially by the media and business—on other variables that more accurately distinguish who people really are. At a time when diversity in terms of worldview and culture is receiving frontline attention from researchers and practitioners, it may be impractical to continue with the idea that labels based on generational cohort will suffice to differentiate individuals.

In the end, it's our view that if we are truly interested in stemming environmental losses due to hazards like climate change, then simply waiting or hoping for people from younger generations to "save the world" is not a safe bet. Instead, by actively engaging with members of the general public who already share a biospheric value orientation and a more liberal political orientation, we may be able to further empower their predisposition to environmental concern and action. In addition, policy and business leaders will have to redouble their efforts to make and follow through on their environmental and sustainability committments.

To address those who self-report a more conservative political orientation, or those who do not value biospherism, we may need to change the morality and value-laden language that we use around environmental issues. Dominant value orientations such as biospherism and ideologies such as political ideology tend to be relatively stable over extended periods of time and are difficult to alter (Schwartz, 1992, 1994; MCright, 2011). Thus, we may do better by framing environmental discourse in terms of the morals and values that people already hold.

For example, research on moral foundations has shown that some moral concerns, such as purity, are more prominent among conservatives than liberals (Haidt and Graham, 2007; Markowitz and Shariff, 2012). Therefore, framing environmental discourse purity can increase environmental attitudes in conservatives, and thus reduce the difference in environmental concern between liberals and conservatives (Feinberg and Willer, 2013). This communication strategy may be useful in encouraging support for concern and future action. Similarly, it may be beneficial to use altruism- or egoism-based appeals for environmental action to audiences who value those orientations more highly than biospherism (Schultz and Zelezny, 2003).

This study was not without limitations. For example, this study is related to how the climate-related environmental losses evaluated in this study were framed. Climate change is a highly polarizing topic (Feinberg and Willer, 2013) that divides liberals and conservatives; indeed, the differential reaction of liberals and conservatives was central to our findings regarding the perceived severity of the losses and support for future actions. However, because we were also interested in generational differences, it would have been useful to also characterize small and large environmental losses without drawing attention to climate change. Doing so could have led to the appearance of more pronounced generational differences.

A second limitation of this study, is that the overall effect sizes we observed were fairly small according to traditional guidelines (Cohen, 1988) especially for political orientation. This may be due to the granularity of the political orientation question. In the future, a question that provides participants with fewer alternatives may be beneficial.

A third limitation of this study is that our survey was hosted on an online platform with a sample that encompassed a wide variety of ages (from ages 18–90). In the past, older adults have expressed their discomfort with going online and, while this is slowly changing (Smith, 2014), those who currently participate in online surveys may not accurately reflect the perspective of the average older adult.

In spite of these limitations, however, our results suggest that age and generational cohort may not be among the most robust predictors of climate concern and willingness to act as we found no evidence of effect. This conclusion may be disheartening to those—especially people in the media and in government—who had hoped to rely on the perceptions, values, and actions of younger people as a firewall to the worsening of many of the environmental problems currently faced by society (e.g., see recent reporting by National Public Radio[5]). As an alternative, this study does demonstrate that the best place to focus messaging and action may instead be on bridging the societal divide across political and value orientations.

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[5] https://goo.gl/bqbSy1.

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